QLA 4: Software Design

Background

A "*Course Registration System*" is a software application designed to manage the registration process for college courses. The business logic for such a system involves several key components:

- "*User Authentication and Authorization*" allows students, faculty, and administrators to log in with their unique credentials. User roles and permissions are defined, distinguishing between students, instructors, and administrative staff.
- "*Course Catalog Management*" provides an up-to-date course catalog, listing all available courses for a given semester or academic year. Course details such as course name, description, prerequisites, schedule, and availability are stored and managed.
- "*Student Registration*" allows students browse the course catalog, search for specific courses, and add them to their registration cart. The system enforces prerequisites and restrictions, ensuring that students meet course requirements. Registration periods and deadlines are also established to prevent late or unauthorized registrations.
- "*Waitlisting*" allows students to join a waitlist if a course is full. As spots become available, waitlisted students are notified and given the option to register.
- "*Course Enrollment Management*" monitors course capacities and maintains a waitlist if applicable. Automated checks are in place to avoid schedule conflicts and ensure students do not exceed credit limits.
- "*Payment and Financial Integration*" may be integrated with a payment gateway for tuition and course fee payments. Students can view their outstanding balances, receive notifications, and make payments online.
- "*Academic Advising*" allows academic advisors review and approve students' course selections. Alerts are generated for advising sessions and academic milestones, such as graduation requirements.
- "*Instructor Management*" allows instructors view their course rosters, access student information, and submit grades.
- "Administrative Tools" allow administrators have access to comprehensive tools for managing the system, including user management, course catalog updates, and reporting on course enrollment, student demographics, financial data, etc.
- "*Communication*" facilitates communication between students, faculty, and administrators via email notifications, alerts, and messages. Notifications are sent for course changes, registration deadlines, and important dates.

The *Course Registration System* may need to integrate with other college systems, such as the student information system (SIS) and the learning management system (LMS).

Q1 [40 marks]

Create a class diagram for this system. Your model must include at least one instance of each of the following relationships:

- Implementation/Realization
- Generalization
- Aggregation and/or Composition

Q2 [30 marks]

Attached to this assignment you find a draft implementation of the business logic of this system in Java language. This implementation suffers from design issues. Identify three different design principles that are violated in this code. For each violated principle, provide an instance of violation, and suggest a better design for each case.

Q3 [15 marks]

Considering the implementation provided for class "*Student*", Identify what relationship exists between this class and the following classes:

- Class "*Transcript*"
- Class "*Course*"
- Class "*Grade*"

Explain your answers.